SECTION 113 - LIGHTING & ELECTRICAL SYSTEMS

1. LIGHTING

A. Lighting Furnished by Owner. The Contractor shall assemble, install, align and test Owner furnished lights, bulbs, ballasts and cross arm assemblies, with the direct supervision of the lighting manufacturer. Information regarding the lighting manufacturer may be obtained from Mr. Steve Snyder, City Director of Parks and Recreation, at 309-5765.

B. The Contractor shall be responsible to verify and inspect Owner furnished items, prior to submitting a BID, and shall provide and install any or all additional items, such as bolts, brackets, mounts, conduit, supports, etc., for a complete lighting system as indicated or implied by the Drawings and Specifications.

2. STEEL - BASE PLATE MOUNTED

A. Structural Desing-Wind Criteria. All poles and methods of installation of poles shall be designed to withstand the overturning moment created by wind loads on poles and luminaire assembly (EPA) at each location. The entire structure, including pole and luminaire assembly, shall withstand forces equal to 100 MPH wind level with a 1.3 gust factor without damage or misalignment of the luminaire assembly. Poles shall be set according to approved drawing and shall be plumb within three feet (3') of location.

B. Pole Specifications. The base bid for this project shall include standard steel poles base plate mounted on reinforced concrete piers. Alternate bids may be submitted for concrete poles manufactured by Sherman International Pole Division of Birmingham, Alabama or equal. Also, alternate bids will be accepted for the Musco Light-Structure 5-Piece System or equal. Each of the alternate materials shall be designed in accordance with these specifications.

1. Steel Poles. All steel-base plate mounted poles shall be designed to withstand forces specified in the Structural Design and shall be provided with welded steel base plates to accept pole pier anchor bolts. These base plates shall be fabricated from steel plate that meets minimum yield strength of 36,000 PSI. The anchor base shall telescope the pole shaft and be circumferentially welded top and bottom. The base plate shall have slotted bolt holes to allow for a 1/2" variation in anchor bolt setting. Anchor bolts shall be fabricated from a commercial quality hot rolled carbon steel bar that meets minimum yield strength of 50,000 PSI. Anchor bolts shall have the threaded end galvanized a minimum of 8" in accordance with ASTM A-153.

Poles shall be equipped with reinforced handhole containing equipment grounding lug and cover plate approximately twelve inches (12") above base plate. A minimum of three 1-1/2" couplings with accompanying 4" x 5-1/2" or 3" x 5" reinforced handhole including positioning back up bars and galvanized cover plates shall be provided to service the luminaries, disconnects, and ballasts. Fixture manufacturer to determine quantity and location of these items. All poles shall be furnished with a J-hook at the top

of the pole and removable aluminum or galvanized pole caps designed to fit. All interior surfaces to be free from sharp edges and inside of poles to be free of slag.

Overall pole length shall be 60 feet. Poles will be designed in accordance with ASA (USA) specifications. Minimum yield strength to be 51,000 PSI. Welding shall be done in accordance with latest American Welding Society specifications by certified welders. Submerged arc welds are required at the base. Pole coating will be hot dipped galvanized, meeting ASTM-A123. Steel poles shall meet design specifications as manufactured by Whitco Company, Catalog No. W60-0-12.5T-GA-RC or Valmont Company DS210, Catalog No. W.5J600-P4, pole or equal at East Crawford Recreation Area.

2. Concrete or Concrete/Steel Composite Poles. Concrete poles shall be centrifugally spun poles as manufactured by Sherman International Pole Division or equal. Design criteria and shop drawings for materials and installation shall be submitted prior to installation. Composite poles shall be pre-cast concrete base with steel poles as manufactured by Musco Sports Lighting, Inc., or equal. Design criteria and shop drawings for materials and installation shall be submitted prior to installation.

C. Soil Conditions. The design criteria for these specifications are based on soil conditions with 200 PSF or greater lateral load at the surface. It shall be the Contractor's responsibility to notify the Owner of soil conditions other than the design criteria.

D. Pole Installation.

1. Pole Pier. Contractor shall provide pole piers for base plate mounted poles. Piers shall be designed for a minimum of 200 PSF soil and shall withstand EPA forces on the entire assembly as specified in Structural Design. The pier design shall provide anchor bolts to receive steel pole base plate, and contain rigid galvanized or PVC conduit to receive underground feeder circuits from trenches and extend to center of base plate. The Contractor shall provide and install one 5/8" by 8' long copperweld ground rod at each pier approximately three feet (3') from the pier in undisturbed earth at a minimum of twelve inches (12") below grade. A #6 bare copper ground wire shall be extended from this ground rod through a PVC raceway to approximately two feet (2') above the foundation.

2. Alternate Pole Material Installation. The installation of concrete poles or the composite concrete/steel pole system shall be in accordance with manufacturer's specifications. The manufacturer shall design the alternate systems and installation thereof in compliance with these specifications.

3. Backfill. If backfill is required in the construction of the pole piers, the backfill shall be of an approved clay or sand and shall be placed in 6" layers and each layer shall be compacted to 95% of the maximum dry density.

3. ELECTRICAL

A. System Design. The electrical wiring system shall consist of a field contractor w/keyed switch, a main entrance service panel-board on the designated pole, with underground feeder or branch circuits to each luminaire pole. Branch circuits shall extend up pole to the luminaire assembly and connect to ballast supplemental fuse terminal bar. The systems shall be designed to result in no greater than 3% voltage drop at any luminaire. The system shall have overcurrent protection for each service, feeder, branch circuits and ballast. Each pole shall have a ground-conductor (NEC 250-24). A neutral conductor connecting to the service system ground shall be run from circuit breaker panel to all safety disconnects and luminaire assembly equipment. For ungrounded systems, a grounding electrode shall be established at the entrance and connect to equipment grounding conductor which connects to the circuit breaker panel, all safety disconnects and luminaire assembly equipment. The power supply to the main service entrance panelboard shall be provided by the utility company and the owner as shown on the accompanying drawings.

B. Service Entrance. As indicated on the Drawings, install a SQUARE D 8903-SQH-2 contractor, with a SQUARE D-9001-KS11K3/KA2 switch and a main entrance circuit breaker panelboard to be located as shown on the Drawings and shall be a circuit breaker panelboard with NEMA #R enclosure. Circuit breakers shall be the plug-on type. Panelboard shall be SQUARE "D" type I-line, NEHB, or approved equal. Service underground conductors (laterals) shall be installed in rigid galvanized steel conduit or IMC from service entrance equipment and extend to the bottom of the trench with 90 degree elbows at its outer end. If raceway is not continuous, open butt end shall be protected with insulating type bushing.

C. Underground Feeder and Branch Circuits.

1. Feeder Circuits. Underground wiring for feeder circuits shall run from the circuit breaker panelboard to luminaire pole. Underground feeder circuits shall run to handhole at base of the pole. The minimum size conductors for feeder circuits shall be no less than 30 ampere rated.

2. Branch Circuits. Underground wiring for branch circuits shall run from circuit breaker panelboard to luminaite pole. Underground branch circuits shall run to handhole at base of the pole with taps to the luminaire pole. The minimum size conductors for branch circuits shall be no less than 20 ampere rated.

3. Rigid Conduit. For steel base plate mounted poles, the pole pier shall contain rigid galvanized steel conduit to receive underground cable from trenches and extend to the center of the base plate. Feeder or branch circuits shall be direct burial cable or direct burial non-metallic conduit as specified. All ends of a raceway that are not continuous shall have open butt ends protected with insulating type.

4. Direct Burial Cable. Feeder circuits shall be direct burial cable of copper type.

D. Junction Boxes. Feeder or branch tap junction boxes shall be mounted

approximately eight feet (8') above final grade on all steel, concrete or composite poles and shall be WEIGMANN #RSC886, or an approved equal.

E. Branch Circuits on Poles. Branch circuit wire shall not be less than 20 ampere rated and shall be copper building code wire type THHN insulated. For steel poles, branch circuits shall run inside of pole from handhole to ballast box and shall be supported with strain relief connectors.

F. Overcurrent Protection.

1. Service Entrance. Service entrance feeder or branch circuits shall have properly sized overcurrent protection. The circuit breaker must be compatible with the specified panels and shall be thermal magnetic plug-on type with a common trip handle for multi-pole breakers. Exterior tie handles shall not be acceptable. The AIC rating of circuit breakers shall equal or exceed the available fault circuit at the main lug terminals. The circuit breakers shall be SQUARE "D" -FA, or EH plug-on circuit breaker or approved equal.

2. Branch Circuit Fuses. All branch circuit fusible disconnect switches shall be protected with Class "R" fuses.

3. Ballast Supplemental Fuses. All luminaire fixture ballasts shall be individually protected against overcurrent. 480/277 volt ballast protection shall be Limitron Bussman Fuse #KTK or approved equal 600 volt rated. 120, 240, 208 volt ballast protection shall be Fusetron Bussman Fuse #MDA or approved equal.

G. Grounding. Main entrance service and all luminaire assemblies and poles shall meet the following requirements for grounding:

1. Grounding at Service Entrance. The service entrance circuit breaker panelboard shall have #6 bare copper grounding electrode conductor connected from the neutral bar to two parallel 5/8" x 8' copperweld ground rods buried a minimum of twelve inches (12") below final grade with a minimum six foot (6') separation between rods. If ground rods cannot be installed vertically, they may be installed at no less than a 45 degree angle from vertical or buried horizontally in a trench two and one-half feet (2-1/2') deep.

2. Grounding at each Luminaire Pole.

a. Grounding Electrode. Each luminaire pole shall have a grounding electrode ground rod located at the base of each pole. The ground rod at each pole shall be located approximately three feet (3') from the pole in undisturbed earth and shall be 5/8" x 8' copperweld ground rod buried a minimum of twelve inches (12") below final grade. This ground rod shall be connected to a #6 bare copper grounding electrode conductor and shall be connected to the neutral bar in the branch circuits safety disconnect switch.

b. Luminaire Equipment Ground. For steel poles equipment ground

wire shall run inside pole from handhole, ground lug to ballast box and shall be supported with strain relief connectors.

3. Lightning Protection.

a. Steel Poles. Steel poles shall have handhole access hole at the bottom of the pole and be provided with a grounding lug. #6 bare copper ground wire shall extend from the ground rod to the grounding lug located in the handhole. A separate PVC raceway shall be proved when required. Refer to Section III Pole Specifications.

H. Trenching. Trenching depth and width shall be adequate to install direct burial cable and conduit with minimum cover of thirty-six inches (36").

Trenches shall be backfilled with excavated solid and compacted to 90% of the maximum dry density. Backfill may be accomplished by tamping or water jetting and flooding until full settlement has been reached.

Special attention shall be taken at all locations where 90 degree rigid galvanized steel conduit extends into trench. Backfill beneath elbow shall be tamped to approximately the same density of surrounding soil to eliminate shearing action on conductors.

Coordinate at all trenching with existing conditions, utilities, irrigation system, and work being done by others.